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THE FISHERIES LABORATORY AT BEAUFORT, SIXTH SEASON.

THE Fisheries Laboratory at Beaufort, N. C., was open to investigators for its sixth season from June 10 to September 30, 1904. A few days prior to this time two of the laboratory tables were occupied and a few investigators continued their work after the date of closing, but in these cases the facilities of the laboratory only were supplied, the dining hall, living rooms and electric-light department not being open outside the regular season.

A furnished living room was assigned to each investigator or assistant who desired to live at the laboratory, for the use of which a fee of twenty-five cents was charged to cover the expense of laboratory laundry. Table board was provided at the cost of the materials used and the wages of the waiters, the laboratory, as hitherto, supplying the cook, an assistant, and the kitchen and dining room equipment. The price of board was fixed at \$5.50 per week, but, as indicated above, this department was run as a mess and at the end of the season a rebate was paid to each member, which reduced the actual cost of board to about \$4.80 per week.

The entire laboratory was lighted with electricity from dusk until eleven o'clock p.m. and the work tables and aquaria in the laboratory and aquarium hall were furnished with a continuous supply of running water, both salt and fresh. The occupant of each table was supplied with a limited amount of glassware and the reagents in common use. The equipment for collecting and general field work, which was available to all, consisted of a steam launch, a 33-foot sharpie, nine rowboats, a pound net, a fyke net, seines, scrape nets, tow nets, dredges, a trawl and implements for digging. With this equipment the entire harbor and the adjacent sounds were within easy reach and, during calm weather, trips

were made outside the inlet, where dredgings and towings were frequently made. This equipment was in the charge of Mr. Charles Hatsel, one of the permanent employees of the laboratory. He is an excellent collector and is thoroughly familiar with the animals of the region and the methods by which they may best be collected. Those carrying on scientific work consulted with him concerning the material needed and he either directed how, when and where the collecting should be done or, if necessary, collected and brought the material to the tables.

The staff consisted of a director, custodian, two laborers, five special assistants, thirteen temporary assistants, an engineer and two firemen in the power house, a crew of three on the steam launch *Petrel*, a janitor for the laboratory and living rooms and a cook and an assistant in the kitchen. In addition to these, eight investigators, representing various institutions, occupied tables in the laboratory and carried on work in various fields of inquiry. The average length of the stay of each was seven weeks.

The temporary assistants were assigned for duty as follows: two were detailed to assist Professors H. V. Wilson and George Lefevre with their work; two were given work in the office; four had the care of the laboratory and premises; three, assisted by one of the special assistants, did the seining and fishing with the pound and fyke nets for the laboratory and helped with the work on the fishes when they were brought to the laboratory; one assistant kept a record of the densities, temperatures and the general climatic conditions as observed by him during the season. Several of these men, when not busy with their regular duties, helped with cataloguing the books of the library.

The additions which were made to the equipment of the laboratory during the summer consisted in a pound net, a fyke

net and sixteen rectangular glass aquaria of graded sizes. Two large concrete aquaria also were constructed and fitted with heating apparatus to be used for observations on the effect temperature may have on the structure and development of a species.

Early in the season letters were sent to more than a hundred American zoologists asking them to send their publications, past and future, to the library. In response to these letters several hundred reprints of scientific papers were received, which, added to the publications of the Bureau of Fisheries and the National Museum already on hand, make a valuable part of the equipment.

ECONOMIC AND SCIENTIFIC WORK CARRIED ON
BY THE LABORATORY.

The several lines of fishery experiment work which have been in operation in connection with the laboratory for several years were continued and enlarged during this season.* Several weeks during the summer were spent by Mr. R. E. Coker (custodian of the laboratory) in Pamlico Sound in connection with the experiments in oyster culture. The progress of this work is best seen from the report by Caswell Grave, now in press, and from the paper by Mr. R. E. Coker on 'Private Oyster-planting in North Carolina,' also in press. Many new experimental oyster beds were made and will be the subject of further observation.

The growing importance of the clam (*Venus mercenaria*) with the development of the canning and bedding industries, has suggested an inquiry into the habits, growth and propagation of this form. Accordingly, during the preceding spring experiments were begun under the direction of Mr. Coker and these were continued

in operation and extended. Arrangements have been made for their continuance during the remainder of the fiscal year.

Mr. Coker continued his study of diversity in the scutes of chelonia, obtaining some material for the further study of correlation in the scutes and bony plates. The forms studied were chiefly the diamond-back terrapin (*Malaclemmys centrata* Latr. and *Thalassoechelys casetta*), but observations were made on a few other species.

The work which is more definitely identified with the summer sessions of the laboratory consists in extended observations on the natural history of the various species representing certain groups of animals and plants. Notes on the following points concerning each species are collected and catalogued: Relative numbers, habitat, food, feeding habits, breeding time, breeding habits, character of eggs, young, migrations, local varieties, etc. Specimens of each species are collected and preserved and placed in the laboratory collection. As a final result of this work it is intended that reports on each group shall be prepared for publication, with descriptions of each species, and illustrations embodying the local observations which have been made. The special assistants who carry on this work are teachers of biology or graduate students in various institutions who have either specialized in or are especially interested at present in the groups in hand. The groups which were studied this season were the sponges, marine algæ, crustacea, actinozoa, fishes and echinoderms.

The work on the Beaufort sponges was begun this season by H. V. Wilson, professor of biology in the University of North Carolina. In addition to a study of the structural characters and natural history of each species he began a series of experiments on the effect of altered temperature and density on the habits of growth, struc-

* The North Carolina Geological Survey cooperates with the Bureau of Fisheries in these investigations.

ture and reproduction of certain forms. Special facilities were afforded for this work and an assistant was detailed to help with it. The observations will probably extend over a number of years. Professor Wilson will report progress from time to time.

Mr. W. D. Hoyt, instructor in biology in the University of Georgia, continued the work on the marine algæ begun by him last season. The intermediate position of Beaufort Harbor between the northern and southern regions, where extended observations have been made on the marine algæ, makes the study of the forms occurring in the Beaufort region especially interesting and important. That it is richer in algæ than has been supposed has been shown by the work already done. During the season twenty-five species were added to the list, which now numbers sixty-nine. All the species are represented by specimens in the laboratory collection. Of the forty species which are properly identified, two are Schizophyceæ, four are Chlorophyceæ, five are Phæophyceæ, four belong to the Dictyotales and twenty-five are Rhodophyceæ. In the case of seventeen forms, the genus only has been determined and in twelve neither the genus nor species is known.

Mr. F. S. Collins, Malden, Mass., has very kindly given valuable suggestions in this work and assisted with the identification of many forms.

Mr. Hoyt has preserved material for morphological work on certain forms and conducted experiments on the branching of *Dictyota dichotoma* induced by injury.

Mr. C. A. Shore, instructor in biology in the University of North Carolina, did for the Beaufort crustacea (exclusive of the amphipods and cirripedes) this season what the year before he had done for the Annelids—the collection in the laboratory was gone over and, as far as was possible with the available literature on the subject,

the specimens were identified. Poor specimens were replaced with perfect ones and specimens of unrepresented species were added when the opportunity afforded. According to the report made by Mr. Shore at the end of the season, the collection now contains specimens of ninety-one species of crustacea, seventy-seven of which are identified. The identification of four is doubtful. In the case of eight forms the genus only has been determined and two are entirely unidentified.

In the above number are included thirteen species collected in 1902 by the *Fish Hawk* from the region between Shackleford and Bogue Banks and the Gulf Stream.

Twenty-two species were added to the list this season and from the unclassified specimens already in the collection thirty-nine species were identified.

Mr. L. R. Cary, graduate student of zoology in the Johns Hopkins University, began work on the anthozoa. In connection with the regular natural history observations and collections, he recorded on charts, provided by the laboratory for the purpose, the local distribution and abundance of each species. His report for the season shows the collection to now contain specimens of eight species of *Alcyonaria*, nine *Actinaria* and three *Madreporaria*. This number does not include the species collected in 1902 by the *Fish Hawk* (two corals excepted), the work on this collection not having been completed. Mr. Cary also made observations on the budding of *Cylista leucolena* and will continue his study this winter on the structure and histology of this form and of the individuals developing from buds.

The actinian larva which has been found from time to time in the tow at Beaufort and which Mr. Cary succeeded in rearing last season and which he described in No. 1, Vol. VII., of the *Biological Bulletin*, has been identified as that of *Epizoanthus*

americana, a species occurring in considerable abundance off the Beaufort Inlet.

Mr. E. W. Gudger, graduate student of zoology in the Johns Hopkins University, had charge of the work on fishes. In addition to the usual work of collecting systematically from various localities, Mr. Gudger undertook the work of determining to what extent the food of two of the most common food fishes, the spot (*Lios-tomus xanthurus*) and hogfish (*Ortho-pristis chrysopterus*) differs in different localities and whether local races are being established within each species. This work was not carried far enough to give data of value.

The list of fishes known to occur in the Beaufort region now numbers 134 species. Specimens of each species, with one exception, are preserved in the laboratory collection. In case the adult individuals of a species are very large, specimens of its young only are preserved supplemented with measurements of the adult. Thirteen species were added to the list this year, six of which it has not been possible to identify.

On account of the interruption to the work of investigation caused by visitors the laboratory room has recently been closed to them, but they are welcomed to all other rooms and buildings. In the museum hall the laboratory collections are arranged for inspection and several aquaria are kept supplied with living fishes and other forms of marine animals and plants. The maintenance and care of these exhibits was in charge of Mr. Gudger and the temporary assistant detailed to help with the work on fishes.

Mr. Gudger also continued to study the breeding habits and the early development of the pipe fish (*Siphostoma Louisianae*). Material was preserved for a detailed study of the egg and young stages this winter.

Caswell Grave, associate in zoology in the Johns Hopkins University, continued to work on the echinoderms. A set of photographs of living specimens of each species is nearly complete. It is hoped that these may be published with the report on the natural history of the Beaufort echinoderms. By isolating the echinoderm larvæ taken in the 'tow' and rearing them through their metamorphosis into the adult form, the identity of several unknown larvæ has been ascertained and many interesting facts regarding the habits of the adults have been discovered. About ninety experiments on the segmenting egg and larva of *Ophiura brevispina* were made in order to study the regenerating capacity of this form in its early stages and to determine the influence which the considerable amount of yolk present in the egg has had on the localization of the germ layers and organ forming materials. The egg and larva of this species are favorable objects for this work in that they live well after injury and in that the eggs fertilized in the laboratory can be reared to the adult form. Experiments on the pluteus of *Mellita testudinata* showed that it lacks almost wholly the ability to regenerate lost parts.

THE INVESTIGATORS AND THEIR WORK.

Dr. George Lefevre, professor of zoology in the University of Missouri, occupied a table in the laboratory from June 15 to August 23. The brief account, given below, of the work done by him is extracted from his report to the director at the end of the season:

1. Artificial parthenogenesis was investigated in *Thalassema mellita* Conn. and it was found that the eggs of this worm could be induced to develop into freely swimming trochophores in the absence of sperm by immersion for a few minutes in very dilute solutions of several acids, both organic and inorganic. Nitric, hydrochloric, sulphuric,

carbonic, acetic and oxalic acids were used successfully, and in favorable experiments fifty to sixty per cent. of the eggs developed into swimming larvæ.

The larvæ arising parthenogenetically are strikingly normal in appearance and structure, and exhibit clearly marked cellular differentiations, as, for example, digestive tract, prototrochal band and apical plate with flagella.

A careful cytological and histological study of the material will be made, and the parthenogenetic development compared in detail with the normal.

2. Material was collected, photographs taken, and observations made in a systematic study of the tunicates of the vicinity of Beaufort.

Dr. Otto C. Glaser, Bruce fellow in the Johns Hopkins University, spent the entire season at the laboratory and engaged in experimental studies on the eggs of *Fasciolaria tulipa*, the natural history of nudibranch molluscs and a study of the development of *Aplysia* sp.?

Aplysias were extremely abundant this season, having been blown upon the Macon Beach and into the harbor by storms. They were actively breeding, and material for the study of the complete life history of the species was secured. Usually this animal is quite rare at Beaufort.

Dr. Glaser also had the supervision of the 'mess' and to his careful management is due the reduction in the price of board which it was possible to make this year.

Mr. Samuel Rittenhouse, graduate student of zoology in the Johns Hopkins University, beginning June 12, spent eight weeks at the laboratory, continuing the studies begun last season on the life history of *Turritopsis nutricula*. From the complete set of material procured he will be able to make a detailed study of the development of this form. He obtained material also for studies of the development

of *Stomatoca apicata*, *S. rugosa* and an undetermined species of *Digonidia*. While gathering this material, by regular towings in various parts of the harbor, Mr. Rittenhouse made observations on the medusæ which appear at Beaufort and preserved specimens of each species. During this season and last he has collected about thirty species of hydromedusæ, seventeen of which are identified.

Mr. Howard E. Enders, professor of zoology in Lebanon Valley College and graduate student in the Johns Hopkins University, was at the laboratory twice during the year, from June 18 to August 6, and during the month of October. He continued his work to get the post-larval stages in the development of the tubicolous annelid, *Chaetopterus pergamentaceus*, and collected material for an anatomical and histological study of the adult. Observations were made on the activities of the worm and its numerous commensals within the tube, and on the processes by which the tube is formed. The distribution of the animal in the harbor was charted.

Mr. Bartgis McGlone, professor of biology in the Illinois Wesleyan University, occupied a table in the laboratory for two months beginning June 26. He studied the breeding habits of *Mæra atropos*, the spatangoid so common at Beaufort, and discovered a method by which the eggs may be artificially fertilized. This result has been repeatedly worked for by several investigators without success, and the discovery by Mr. McGlone is a noteworthy contribution from the laboratory, for it opens to experimentation one of the most favorable objects for experimental study; the egg being small and very transparent and one in which the processes of maturation are postponed until extrusion from the body of the mother.

Mr. McGlone preserved material for a

study of the complete life history of the species.

Mr. B. A. Bean, curator of fishes in the National Museum, and his assistant, Mr. McKnew, spent two weeks at the laboratory, June 6-20, studying fishes and making a collection of certain forms for the National Museum. Mr. Bean went over the Beaufort collection of fishes and very kindly verified or corrected the doubtful identifications of some of the specimens. Tanks of alcohol were left by him at the laboratory, with a request that specimens of fishes taken this season, in duplicate, not collected by him, be preserved for the National Museum. This request was complied with.

Dr. J. I. Hamaker, professor of biology in the Randolph-Macon Woman's College, beginning August 18, spent two weeks in general collecting and in making observations on actinians.

CASWELL GRAVE.

SCIENTIFIC BOOKS.

Heredity of Coat Characters in Guinea Pigs and Rabbits. By Professor W. E. CASTLE. Carnegie Institution of Washington, Publication, No. 23. February, 1905.

This paper includes a careful account of the color varieties of domesticated cavies or guinea-pigs, of which the agouti, the yellow, the chocolate, the black, the albino, the spotted, the brindled, the roan and silvered, the long-haired and the rough-coated forms are described. Cross-breeding between many of these types was carried out and a detailed account of the results is given. Without attempting to review all of the many important results of this elaborate study of heredity a few of the more unusual or salient points may be indicated.

Albino or white guinea-pigs breed true, but crossing experiments with pigs of different colors show that individual albinos give different results, which is due, Castle believes, to the presence, in a greater or less degree, of *latent* pigment tendencies, which do not

show up except in crossing. Thus the albino ♂ 2002 when mated with red females invariably produces offspring marked with black; while albino ♂ 1999 similarly mated produces only red (or yellow) offspring, never black ones. From these and similar results Castle makes a distinction between the two terms *latency* and *recessive*. Latency "is a condition of inactivity in which a normally *dominant* character may exist in a *recessive* individual. It is questionable whether a recessive character may ever be latent." Recessive is used in Mendel's sense to designate a character "which disappears when brought by fertilization into the same (hybrid) individual with a contrasted 'dominant' character, but which is transmitted, distinct from the dominant character, in half of the gametes formed by the hybrid individual."

As is well known pure albino animals have pink eyes. This means that pigment is absent from the eyes as well as from the skin. Now pure white guinea-pigs and mice are known having black eyes. These are not albinos but 'spotted' animals, in which the pigment spots have been so far reduced as to be practically obliterated, except in the eyes. The black-eyed white animals that appeared in Castle's experiments did not breed true, since spotted offspring often cropped up. Whether by prolonged selection they could be made into a pure race can not be stated, but Castle thinks it not impossible. When mated to pure albinos spotted offspring are produced.

Guinea-pigs with a rough coat are animals whose hair is arranged in rosettes or 'cowlicks' around certain centers. Nine such centers can be recognized in individuals with the best developed rough coats. In crossing these roughs with ordinary or smooth-haired forms the rough character is dominant. Here we have another interesting instance of a recently acquired character dominating in the offspring. The rough character is as fully developed as in the rough parent. The offspring of these rough hybrids follow the Mendelian ratio, provided the *degree* in which the rough character is developed in the offspring is left out of consideration. Just here, however, comes a curious result, that is of the